NOTES BY THE EDITOR.

RECORDS OF FOGGY AND CLOUDY DAYS.

Dr. A. C. Simonton, voluntary observer of the Weather Bureau at San Jose, Cal., calls attention to the fact that the blanks for weather reports from voluntary stations have no provision for reporting fog. This is an omission which he thinks ought not to exist. He says that it is just as important to report fogs as cloudiness; while fog lasts there is no sunshine, and yet we can not say that it is clear nor can we say that it is cloudy. Shall we report a foggy day as a clear day? At may points, especially near the ocean, there is much fog, and in climatological records this surely ought to be reported; it is certainly important for those studying the climate of distant regions to know whether there is more or less fog.

The compilers of the new edition of "Instructions" in their efforts to give the voluntary observers as little trouble as possible, have—not only in respect to fog, but in other matters—reduced the instructions and suggestions to the fewest possible words, and have omitted some subjects that, in special cases, may become important. The large majority of our observers never see the true ocean fog, but those who do experience it certainly have the privilege of substituting the word "foggy" for "cloudy," in describing the character of the day, on Form No. 1009.

These instructions were intended mostly for observers in agricultural districts, and it will often happen that observers in cities, or at sea, or on high mountains, or those in extreme northern and southern latitudes, will perceive that they must—in order to do good work—depart from the literal wording of this pamphlet. As is stated on the first page, "To render the meteorological observations taken throughout the United States of the greatest value and to facilitate their use in investigating questions relating to weather, it is important that a uniform sytem of taking and recording observations be adopted." It is evidently of the greatest importance that observations be taken on a uniform system at each station for many years, in order to obtain satisfactory normals, and the publication of the "Instructions of 1897" is not intended to disturb the uniform methods that many of our observers have maintained for so long a time.

HOMOGENEITY AND UNIFORMITY.

As uniformity at many stations over a large area is quite as important as uniformity at one station for many years, therefore, it would be eminently proper for those who have maintained such long records to consider whether—while still keeping up their integrity—they can not also do something additional that will make it possible to compare their own observations with those of distant stations without introducing discrepancies due to methods and instruments.

The most important sources of discrepancy may be enumerated as follows:

Temperature.—(A). A difference of a few feet in the height of thermometers above ground causes an apparent difference in the extreme temperatures at any two stations. (B). A difference in the style of exposure of a thermometer, one being hung on the north side of a house, too close to the wall; another swinging freely in the shade of a tree; a third put within a shelter of double lattice-work, where the wind has not the freest access; all these exposures will necessarily produce differences in recorded temperatures. (C). Unless thermometers are purchased of the best makers—and such are rather expensive—they are very apt to differ among themselves one or more degrees, F., even when stirred about together in a basin of water; the differences due to inclosures and instruments should be applied to the records before any study of climate is contemplated. (D). The differences in the immediate surroundings of two stations due to their being on hills or plains, in valleys or in the shadow of a mountain, or in a forest, will produce local peculiarities that are characteristic of very limited areas, and that must be duly considered in studying the peculiarities of climatic records; this question of special local climates, even in the narrowest possible sense of the word local, interests the botanist and agriculturist, because slight differences become appreciable in the growth of the plant.

Precipitation.—The records of rainfall show even wider variations, both absolutely and relatively, than do the records of temperature. The differences in temperature between two neighboring thermometers are paralleled by the differences in the catch of two local rain gauges. On the average of many years it is found that a rain gauge about a hundred feet above the ground will only catch 65 per cent of the rainfall caught by one at the ground, and it has been shown that this is simply due to the more active and violent action of the wind at the mouth of the upper gauge, since as soon as a gauge is shielded from the wind its record becomes the same whether it is one foot or a hundred feet above ground. For the same reason, gauges at or near the ground catch less in proportion as they are located in windy or sheltered spots; thus, in a set of fourteen gauges observed by Dr. Hellmann, near Berlin, in a region over which the average rainfall for the year must have been practically identical, some showed deviations of 14 per cent, which at first seemed to be due to the influence of forests, but were soon found to be simply the irregularities of the deficiencies in the catch of the rain gauge, being in fact in the nature of an error in the catch, due to the strength of the wind at the mouth of the gauge.

These paragraphs suffice to illustrate the extreme importance and difficulty of obtaining true temperatures and true rainfalls and the necessity of bearing in mind the uncertainties of our methods of observation and the incongruity of our data when we attempt to study minute peculiarities of climate.

It is hardly to be expected that the majority of the voluntary observers would care to devote that labor and thought to the subject which specialists in hygiene and climatology delight in, therefore the Weather Bureau avoids every appearance of imposing upon the voluntary observer, strictly so-called, the labor that many "special observers" willingly undergo for the sake of advancing the inquiries in which they are personally interested. It must, however, be recognized that every voluntary observer has, by the very fact that he voluntarily keeps a record, shown that he has some special interest in some part, if not the whole, of climatology. Therefore, to each one we may say: keep your record so that it shall be satisfactory to yourself in regard to the particular questions in which you are personally interested.

ELECTRICAL DISTRICTS.

Within the past few months several correspondents of the Weather Bureau have called attention to the fact that there exist here and there small and well-defined localities that are peculiarly subject to severe lightning strokes, and some explanation of this phenomenon has been requested. As

usual in such cases the main question is overlooked, viz, the clear and definite establishment of the fact. It is not sufficient to show that the lightning has struck several, or even many times within a limited radius, but one must show that it has not struck an equal number of times within the same area outside of that radius.

If the average of many years of observation shows that there really is a special frequency of lightning stroke in a limited region we have then to seek for the cause either near the ground or in the clouds. It is not likely that the cause consists in anything far below the surface of the ground. At the surface we know that tall trees, small hills, and tall buildings or monuments are most liable to be struck. As to the clouds we know too little about the cause of lightning to hazard any hypothesis. There are, however, three well established generalizations that will sometimes guide our investigations, viz, that thunderstorms are especially liable to begin in certain regions, that they pursue paths in directions radiating therefrom toward the east and northeast, and that they grow in severity up to a maximum at certain hours of the day. From these three principles it results that lightning will be most frequent along the favorite paths of thunderstorms and in those paths at certain hours of the day; if two favorite paths intersect, then the region of intersection will be especially rich in lightning strokes, provided that storms moving along these paths pass over that region at those hours of the day when the storm intensity is at a maximum.

Both from the practical point of view of the insurance companies, and from the philosophical point of view of the meteorologist, it is very desirable that we should have well established information relative to the distribution of lightning and thunderstorms, and the Editor will be pleased to publish a careful discussion of the complete record of all the lightning strokes that have fallen in any region as large as a township.

In conducting an investigation into the frequency of lightning, it is quite necessary to compare together equal areas; thus, it is often said that a city is less liable to severe strokes than the surrounding country, but, of course, this country area represents an area indefinitely larger than the city, and the comparison has no value unless we compare equal areas of the country and the city. It has been said that the western portion of the city of Washington (viz, Georgetown) is less subject to lightning than the rest of the city; but this "rest of the city" embraces an area that is more than ten times as large as Georgetown, and should, therefore, receive ten times as many strokes if they are evenly divided over the surface of the country.

Mr. W. M. Smith, voluntary observer at Van Wert, Ohio, states that there is a small region between South Avenue and Boyd Avenue, in that city, that is peculiarly subject to lightning strokes. An investigation of this and similar cases would doubtless prove instructive; but, as above stated, before undertaking to investigate the causes, we must first establish the fact very clearly and definitely by studying the frequency of strokes in equal areas of the surrounding region as carefully as we study the frequency in the electrical district itself.

The importance of considering the area and of determining the frequency per unit area is frequently lost sight of in statistical meteorology, and perhaps the most notable misapprehensions in this respect have been made with regard to the distribution of tornadoes, as shown in the following note.

TORNADO FREQUENCY PER UNIT AREA.

Several States of the Union have long been famous for tornadoes, and the popular dread of these destructive storms has been said to operate against the settlement of those States and against the peace of mind of the inhabitants. But the idea that tornadoes are very frequent has, to a large extent, resulted from a neglect to make proper allowance for the relative area of the respective States and of the tornado itself.

The chance of injury from a tornado evidently depends upon both the frequency of tornadoes per unit area and on the area covered by the path of the tornado, viz, the product of its length by its breadth. The area of destruction in any individual case will rarely amount to more than 25 square miles. Owing to the extremely local character of the destruction, our records of these storms become imperfect in proportion to the sparseness with which the country is settled, and in the newer States there is sometimes an apparent increase in the number of tornadoes, owing entirely to the increase in the inhabited area, and the consequent increased completeness of the record. In fact, our records for Kansas and Nebraska relate almost entirely to the eastern half of each State. In spite of the imperfection of our records the data contained in the following table has considerable value both to the meteorologist, the local inhabitant, and the insurance agent:

Tornado frequency.

States.	Area in units of 10,000 sq. miles.	Total number of tornadoes.			Annual average.	
		1874-1881. Finley.	1889-1896. Henry.	16 years.	Per State.	Per unit area.
Alabama	5.1	12	13	25	1.56	0.30
Alaska	51.7	0	0	0	0.00	0.00
Arizona	11.4	2	0	2	0.12	0.01
Arkansas	5.2	8	18	26	1.62	0.31
California	15.8	1	0	1	0.06	0.00
Colorado	10.4	1	1	2	0.12	0.01
Connecticut	0.5	2	0	2	0.12	0.24
Delaware	0.2	0	0	0	0.00	0.00
Dist. of Columbia	0.0	0	0	0	0.00	0.00
Florida	5.9	5	1	6	0.38	0.07
Georgia	5.8	29	12	41	2.56	0.44
Idaho	8.6	0	0	0	0.00	0.00
Illinois	5.5	50	29	79	4.94	0.90
Indiana	3.4	24	7	31	1.94	0.57
Ind Ter. and Okla	6.9	1	13	14	0.88	0.13
Iowa	5.5	26	28	54	3.38	0.61
Kansas	8.1	55	47	102	6.38	0.79
Kentucky	3.8	5	11	16	1.00	0.27
Louisiana	4.1	11	7	18	1.12	0.28
Maine	3.5	3	3	6	0.38	0.11
Maryland	1.1	8	3	11	0.69	0.63
Massachusetts	0.8	7	1	8	0.50	0.63
Michigan	5.6	13	5	18	1.12	0.20
Minnesota	8.4	21	22	43	2.69	0.32
Mississippi	4.7	9	15	24	1.50	0.32
Missouri	6.5	40	16	56	3.50	0.54
Montana	14.4	1	0	1	0.06	0.00
Nebraska	7.6	14	22	36	2.25	0.31
Nevada	11.2	1	0	1	0.06	0.00
New Hampshire	0.9	3	0	3	0.19	0.21
New Jersey	0.8	5	6	11	0.69	0.86
New Mexico	12.1	1	0	1	0.06	0.00
New York	4.7	20	5	25	1.56	0.33
North Carolina	5.1	14	2	16	1.00	0.20
North Dakota	7.1	4	2	6	0.38	0.05
Ohio	4.0	21	8	29	1.81	0.45
Oregon	9.5	0	0	0	0.00	0.00
Pennsylvania	4.6	17	13	30	1.88	0.41
Rhode Island	0.1	0	0	0	0.00	0.00
South Carolina	3.4	13	3	16	1.00	0.30
South Dakota	2.7	5	21	26	1.62	0.21
Tennessee	4.6	15	10	25	1.56	0.34
Texas	27.4	18	35	53	3.31	0.12
Utah	8.4	0	0	0	0.00	0.00
Vermont	1.0	2	0	2	0.12	0.12
Virginia	6.1	9	2	11	0.69	0.11
Washington	7.0	0	0	0	0.00	0.00
West Virginia	2.3	1	0	1	0.06	0.03
Wisconsin	5.3	11	10	21	1.31	0.25
Wyoming	9.8	1	0	1	0.06	0.01

The third column shows the number of tornadoes for each State for the eight years 1874–1881, as determined by Lieutenant Finley, and published in 1882. The fourth column contains the similar data for eight years, 1889–1896, as collected by Mr. A. J. Henry and published in the last annual volume of the Weather Bureau. To these items the Editor has added, in the second column, the area of the respective States, expressed in units of 10,000 square miles, or 100 miles square, as also finally the resulting averages showing the